

## A Magic Remedy of Castor Oil

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**ABSTRACT:** *Ricinus communis* L. (*R. communis*), often known as castor oil plant, is utilised as a traditional natural cure or folkloric herb for the control and treatment of a wide range of ailments all over the world. Various investigations have indicated the existence of various phytochemicals such as alkaloids, flavonoids, terpenes, saponins, and phenolic compounds such as kaempferol, gallic acid, ricin, rutin, lupeol, ricinoleic acid, pinene, thujone, and gentisic acid. Anticancer, antibacterial, insecticidal, antioxidant, anti-diabetic, antinociceptive, anti-inflammatory, bone regenerating, analgesic, and anticonvulsant activity are among the pharmacological and therapeutic actions of these phytochemicals. *R. communis* might be a suitable option for developing innovative supplementary medications due to its large range of phytochemicals, pharmacological action, and subsequent clinical trials. The findings show that the plant has a wide range of medicinal properties that can help with ailments such as cancer, diabetes, ulcers, and anthelmintics, among others. As a result, in the medical profession all portions of the medicinal plant *R. communis* are thought to be quite useful.

**KEYWORDS:** *Ricinus communis*, Medicinal properties, Phytochemical constituents, Bioactive compounds, Anti-cancer, *Ricinus communis* L. Essential oil.

### I. INTRODUCTION

Castor oil is a commodity that has been traded since antiquity. The oil is extracted or expressed from the seed of a plant with the botanical name *Ricinus communis*, which belongs to the Euphorbiaceae family<sup>[1]</sup>. India is the world's leading producer of castor oil, as well as the world's largest exporter of castor oil. The production of castor oil in this country varies between 250000 and 350000 tonnes each year. Gujarat accounts for over 86% of castor seed output in India, followed by Andhra Pradesh and

Rajasthan<sup>[2]</sup>. Castor oil is used commercially as a highly renewable resource for the chemical industry. It is a vegetable oil obtained by pressing the seeds of the castor oil plant (*Ricinus communis* L.) that is mostly cultivated in Africa, South America, and India<sup>[3]</sup>. Before the determination of chemical and synthetic compounds, these plants played a significant role as a traditional medicine for curing various diseases throughout the world<sup>[4]</sup>. Traditional and conventional medicines rely on a variety of natural resources, including plants, which are a significant source of folklore medicine<sup>[5]</sup>.

India is the world leader in castor seed and oil production, as well as the worldwide commerce in castor oil<sup>[6]</sup>. Biological impacts of plants are determined and reflected by numerous bioactive substances found in them, which serve as ligands and bind to the protein targets of a specific disease, virus, or tumour cell, causing them to act<sup>[7]</sup>. The medicinal or biological properties of a plant are determined by the active ingredients that make it up. The castor bean plant has a variety of chemical elements (leaf, fruit, seed, stem, and oil, for example), with ricin being the most active<sup>[8]</sup>. Despite the fact that ricin has several consequences, humans have used this plant seed for medicinal purposes since ancient times. A number of reasons have several benefits to this plant. Potential therapeutic application for preventing illnesses and ensuring that no harm is done if the dosage is maintained, the health consequences suitably (below the toxic level). *Ricinus communis* L. (*R. communis*) is a medicinal plant that grows to approximately 6 metres in height and is found all over the world, including the Arabian Peninsula. The castor plant has been cultivated for over 6000 years<sup>[9]</sup>. Castor is one of the oldest cultivated crops, although it barely accounts for 0.15 percent of global vegetable oil production. Because it is the sole commercial supply of a hydroxylated fatty acid, the oil generated from this crop is considered important to the worldwide speciality chemical sector<sup>[10]</sup>.

## II. PROPERTIES

Castor beans are grown for the seeds, which produce a thick, pale yellow non-volatile, non-drying castor oil<sup>[11]</sup>. Castor oil's unusual structure provides intriguing features, making it suitable for a variety of industrial uses. Upto 90% ricinoleic, 4% linoleic, 3% oleic, 1% stearic, and less than 1% linolenic fatty acids are found in castor oil. The high amount of ricinoleic acid (RA), which is employed in a number of chemical applications, makes castor oil lucrative<sup>[12]</sup>. Castor beans are grown for their seeds, which produce a thick, pale yellow, non-volatile, non-drying castor oil<sup>[13]</sup>. Castor oil has hydroxyl functionality of Ricinoleic acid and it is a natural polyol that provides oxidative stability and a longer self-life than other oils by inhibiting peroxide production. Because of these unique quality it enable it to be employed in industrial applications such as paints, varnishes, inks and lubricants<sup>[14]</sup>.

## III. USES AND BENEFITS OF CASTOR OIL

- [1]. Hair Growth- Castor oil improves blood circulation to the follicles, which encourages hair growth. The oil also contains Omega-9 fatty acids, which aid to keep hair healthy and decrease split ends, resulting in less hair fall. It penetrates the scalp's pore openings, nourishing and moisturising the hair while also acting as an antibiotic, antifungal, and anti-inflammatory. It can also be used with other carrier oils like almond or olive oil to aid absorption<sup>[15]</sup>.
- [2]. Laxative- The capacity of castor oil to serve as a natural laxative is widely known. Ricinoleic acid, which is a component of castor oil, is the most important fatty acid. When this acid enters the colon, it has a laxative effect, which helps with bowel movements<sup>[15]</sup>.
- [3]. Constipation - Castor oil capsules have long been recognised to be beneficial for persons suffering from constipation and digestive problems since it is a good laxative<sup>[15]</sup>.
- [4]. Healing -Castor oil can be used to treat wounds by minimising the risk of infection due to its antibacterial and antifungal characteristics. Castor oil also improves blood circulation, which reduces the risk of infection and speeds up the healing of wounds<sup>[15]</sup>.
- [5]. Acne- Hormones, skin irritation, and inflammation, as well as the accumulation of dead skin cells and bacterial imbalance on the skin, all contribute to acne. Because the oil is antibacterial and anti-inflammatory, it's an excellent moisturiser for acne-prone skin<sup>[15]</sup>.
- [6]. Varicose veins - A varicose vein is a medical disorder in which the veins inside the body bulge and twist. Despite the fact that this issue affects one-quarter of all adults, overweight people and pregnant women are more prone to have this health problem. It often affects the legs and feet and is caused by blood clotting or reverse blood flow within the veins. Castor Oil's anti-inflammatory characteristics, as well as its capacity to improve blood circulation, make it a beneficial natural cure for varicose veins sufferers<sup>[15]</sup>.
- [7]. Yeast Infection - Yeast infection is caused by an excess growth of fungus known as *Candida albicans*, a kind of fungus that is found naturally throughout the body, including the skin, mouth, genital region, and digestive tract. Castor oil is an effective alternative cure for persons suffering from a low to medium degree yeast infection owing to its natural anti-fungal, anti-bacterial, and anti-microbial qualities<sup>[15]</sup>.
- [8]. Arthritis - Castor oil is a fantastic alternative to normal massage oil for persons who suffer from arthritis, painful muscles, and nerve irritation due to its anti-inflammatory properties<sup>[15]</sup>.
- [9]. Cancer - Early clinical investigations show that ricin can be coupled with antibodies to restrict the poison's effect on malignant and impacted cells while also reducing tumour growth in lymphoma patients. Oncologists have begun employing castor oil as a medium for delivering specific types of chemotherapy medications to malignant tumours, according to the American Cancer Society, by using a castor oil compound called Cremophor EL as a carrier for paclitaxel<sup>[15]</sup>.
- [10]. Improved Immunity - The strength of our immune systems determines how quickly we become unwell or how well we recover from disease. Castor oil packs may increase lymphatic circulation in our bodies, which can help us boost our immunity<sup>[15]</sup>.

## ADMINISTRATION

Castor oil is taken orally because it must be broken down by intestinal lipases in order to exert its stimulating laxative effects. The World Health Organization decided that a daily dosage of up to 0.7mg/kg is suitable for an adult man<sup>[15]</sup>.

#### IV. PHARMACOLOGICAL ACTIVITIES OF CASTOR OIL

##### 1. ANTIFUNGAL ACTIVITY

Antifungal activity has been found in many sections of *R. communis*, including the root, leaf, and stems. *R. communis* extracts, both methanolic and aqueous, have been reported to be effective against a variety of fungus species. A study was carried out for testing the antifungal activity of *R. communis* extract against various fungal species, the maximum antifungal activity was shown against *Candida albicans*, and lowest activity was detected against *Alternaria solani*<sup>[16]</sup>. The co-administration *Ricinus communis* with the immunosuppressant drugs for the prevention of infection against oral cancer treatment patient showed a significant result<sup>[17]</sup>. One of the studies, showed that the methanolic extract has prominent inhibitory activity against *Aspergillus niger* and *Aspergillus fumigatus* and less activity against *Aspergillus flavus*<sup>[18]</sup>. Another study, carried out with aqueous *R. communis* leaf extract have shown lowest activity against *Aspergillus fumigatus* and *Aspergillus flavus*<sup>[19]</sup>.

##### 2. ANTIVIRAL ACTIVITY

*Ricinus communis* leaves were used in ultra-performance liquid chromatography (UPLC-Triple TOF-MS/MS) with hybrid triple time-of-flight mass spectrometry (UPLC-Triple TOF-MS/MS) and assessment its antiviral potential using three mechanisms against three common viruses by various chromatographic techniques<sup>[20]</sup>. From this it was found that *R. communis* leaves has Antiviral activity. All extracts had substantial anti-replicative activity against HAV, notably the methanol and methylene chloride fractions, and moderate anti-replicative activity against COXB4; butanol > methylene chloride and ethyl acetate > methanol<sup>[21]</sup>. Chemically, castor oil, also known as the Palm of Christ in some locations, contains ricinoleic acid (90%), linoleic acid (4%), oleic acid (3%), stearic acid (1%), and less than 1% of linolenic fatty acids<sup>[22]</sup>. Sands mentioned two elements of antiviral processes revealed by a number of fatty acids against bacteriophage in his research. These two fatty acids, oleic acid (18:1) and palmitoleic acid (16:1), have proved to have a very significant antiviral impact. These two fatty acids protect the host cell by preventing the viral Genome from entering the cell<sup>[23]</sup>. In another study, Hilmansson discovered that same six medium chain fatty acids, capric, lauric, and myristic acids, and long chain unsaturated fatty acids, oleic, linoleic, and linolenic acids, had a comparable antiviral activity in blocking

entrance into host cells. This oleic acid is also contained in castor oil, which may contribute to castor oil's antiviral properties<sup>[24-27]</sup>. Based on the results of the experiments above, it can be safely assumed that fatty acids from castor oil have a great potential for providing antiviral action and may be an useful alternative treatment for Covid-19 infection<sup>[28]</sup>.

##### 3. ANTICANCER ACTIVITY

Conducting in vitro investigations on the anti-cancer activities of various medicinal plants that have been utilised as traditional remedies in folklore for the treatment of cancer. To analyse the extract of *Ricinus communis* seed and stem portion, seven human cancer cell lines were used<sup>[29]</sup>. Lin and Liu noticed that when mice were given ricin A, their longevity increases<sup>[30]</sup>. Some studies have showed efficacy against certain cancer cell lines such as melanoma, MCF7 (breast cancer), HepG2 (hepatic cancer), PC3 (pancreatic cancer), and cervical cancer employing fractions with 100 percent ethanol, methanol, and an aqueous phase<sup>[31]</sup>. Various plant components and ricin lectins have been used in, in vitro and in vivo experiments to demonstrate *R. communis*' anti-cancer effectiveness<sup>[32]</sup>. According to You and colleagues, *Ricinus agglutinin 1* triggered fast down-regulation of vascular endothelial growth factor-2 (VEGFR-2) as well as endothelial cell death in tumour blood arteries. The anti-cancer activity of *R. communis*, as revealed by several studies, clearly suggests that *R. communis* may be a good source for anti-cancer therapeutic compounds<sup>[33-34]</sup>.

##### 4. ANTIBACTERIAL ACTIVITY

Antimicrobial activities of *R. communis* and its phytochemicals have been discovered against a variety of bacteria. Some of the crude extract's antibacterial action has been recorded, including suppression of microorganisms like *Staphylococcus aureus* and *Escherichia coli*<sup>[35]</sup>. Methanolic extract had the most efficacy against *Escherichia coli* and the least activity against *Bacillus subtilis* in one investigation<sup>[36]</sup>.

According to a study, *Ricinus* aqueous extract showed the best antibacterial activity against *Staphylococcus aureus* and the lowest activity against *Klebsiella pneumonia*<sup>[37]</sup>.

##### 5. ANTI-INFLAMMATORY ACTIVITY

*R. communis* has been demonstrated to have anti-inflammatory properties. The anti-inflammatory potential of *R. communis* has been studied using various fractions such as ethanolic,

methanolic, and hexane<sup>[38]</sup>. The anti-inflammatory activities of the methanolic extracts of the leaves and root were studied in Wistar albino rats in acute and chronic inflammatory models<sup>[39]</sup>. Lindauer et al. observed that repeated application of ricinolein had anti-inflammatory and pro-inflammatory effects, and that this was mediated by ricinolein<sup>[40]</sup>. At doses of 250 and 500 g/kg, ricinus methanolic extract decreased edoema in cotton pellet granuloma models by 43.28 percent<sup>[41]</sup>.

#### 6. ANTIOXIDANT ACTIVITY

Due to the presence of components such as gallic acid, quercetin, gentisic acid, rutin, epicatechin, and ellagic acid in leaves and methanolic extract, a DPDH (1,1-diphenyl-2-picrylhydrazyl) mediated in vitro investigation demonstrates the antioxidant activity of *R. communis*. Another study revealed *R. communis* as a new antioxidant by demonstrating the scavenging activities of DPDH, NO, and superoxide radicals<sup>[42]</sup>.

*R. communis* ethyl acetate extract was also discovered to be a powerful antioxidant. Flavonoids, instead of tannins, are thought to be responsible for *R. communis*' antioxidant action<sup>[43-44]</sup>.

#### 7. ANTIDIABETIC ACTIVITY

Diabetes is a chronic condition that happens when the pancreas fails to generate the insulin that the body requires or when insulin resistance develops. The bioassay-guided purification of an ethanolic extract of *Ricinus communis* roots (RCRE) was evaluated<sup>[45]</sup>. Another in vivo study on alloxan-induced diabetic rats found that following treatment with *Ricinus* extract, blood glucose levels dropped from 390.0 to 148.5 mg/dL, a 61.97 percent reduction in blood glucose during a 7-day period<sup>[46]</sup>.

#### 8. ANALGESIC ACTIVITY

*R. communis* was discovered to have strong central analgesic properties. The analgesic effect of *R. communis* extract has been demonstrated in a number of investigations. The alkaloid ricinine in *R. communis* causes stimulant effects like hyperactivity, memory enhancement, and clonic convulsions. Ricinine is non-anxiogenic since it does not inhibit the brain's inquisitive behaviour<sup>[47]</sup>. The analgesic activity of an aqueous extract of *R. communis* root bark was compared to a conventional medicine, diclofenac, at a dosage of 50 mg/kg in another investigation. In Albino mice, dosages of *R. communis* extract of 100 and 200

mg/kg were employed. The analgesic action was determined using two methods: Eddy's hot plate method and tail immersion method<sup>[47-48]</sup>.

#### 9. ANTICONVULSANT ACTIVITY

Epilepsy is a common condition in which the brain's neuronal discharges cause seizures. Anticonvulsant action of isolated chemicals from *R. communis* has been studied, and they have proven to be reliable epileptic drugs. All of the animals had convulsions after receiving an electric shock. Animals given a dosage of 60 mg/kg of a chemical derived from *R. communis* seeds had an 82 percent seizure inhibition, compared to an 8.89 percent seizure inhibition with a conventional medication<sup>[49]</sup>.

#### 10. MOSQUITOCIDAL ACTIVITY

The following is the fatal dosage of *Communis* seed extract in several larval species: *Culex quinque fasciatus* (7.10 µg/mL) > *Anopheles stephensi* (11.64 µg/mL) > *Anopheles albopictus* (16.84 µg/mL). *R. communis* was discovered to have the most activity against the malaria vector *Anopheles gambiae*. *R. communis* extracts are toxic to both male and female *Anopheles gambiae* larvae. The existence of two molecules, ricinine and 3-carboxy-4-methoxy-N-methyl-2-pyridone, was thought to be responsible for this action<sup>[50]</sup>.

#### 11. ANTI-ASTHMATIC ACTIVITY

Dnyaneshwar and Patil published a research in which Anti-asthmatic action had been demonstrated in *R. communis*. Saponin concentration in *R. communis* roots had a mast cell stabilising effect, whereas flavonoids are responsible for bronchodilation and smooth muscle relaxant action. In vivo experiments, which are critical in the treatment of asthma, were used to assess the anti-allergic activity. Due to the presence of flavonoids and saponins, the ethanolic extract was efficient in decreasing milk-induced leukocytosis and eosinophilia<sup>[51]</sup>.

#### 12. ANTIHELMINTIC ACTIVITY

The antihelmintic activity of *R. communis* in producing paralysis and the time it took for the worm to die were investigated. Anthelmintic activity was assessed using both ethanolic and aqueous extracts. When compared to ethanolic extract, aqueous *Ricinus* extract revealed strong activity at 100 mg/mL in shorter time, i.e., 8.500.64 (paralysis) and 31.501.25 (death) at a concentration of 100 mg/mL. As a result, the aqueous extract of



*R. communis* was discovered to have higher anti-helminthic action<sup>[52]</sup>.

### 13. ANTIFERTILITY ACTIVITY

In male rats, the anti-fertility effects of *R. communis* were investigated, and epididymal sperm counts were shown to be reduced. Changes in motility and morphology of sperms were detected after treatment with 50 percent ethanolic extracts of *R. communis*<sup>[53]</sup>. In another research, semen parameters were examined in male Wistar rats treated with *R. communis* (10 mg/kg) and testicular function was reported to be suppressed<sup>[54]</sup>.

### 14. BONE REGENERATION

In ancient times, *R. communis* oil was utilised as a herbal and folklore medicine to treat a variety of bone-related disorders. Bone abnormalities, acute osteomyelitis, articular aches, and damaged limbs are among the ailments that *R. communis* used to cure<sup>[9]</sup>. *Lawsonia inermis* and *R. communis* were used in a 14-day animal trial to treat osteoarthritis in rats, and the results showed a substantial effect in therapy with no side effects. A<sup>[55]</sup>.

### 15. ANTIULCER ACTIVITY

*R. communis* was discovered to have potent antiulcer effects. *R. communis* has been shown to have anti-ulcer properties in a testing with an initial dosage of 500 mg/kg. The mechanism behind *R. communis*' anti-ulcer efficacy is the cytoprotective action and strengthening of the stomach mucosa, which results in improved mucosal defence<sup>[56]</sup>.

### 16. LAXATIVE AND UTERINE CONTRACTING

Castor oil causes laxation and uterine contractions by activating prostaglandin receptors 2 with ricinoleic acid. Castor oil and ricinoleic acid cause the smooth muscle in the intestine to contract. The motility of both the intestines and the uterus is impacted. Prostaglandin receptors 2 have been shown to be prospective targets for laxative medicines<sup>[57]</sup>.

## V. CONCLUSION

*R. communis* is a medicinal plant with a wide range of pharmacological benefits for treating a variety of illnesses and ailments. *R. communis*' anti-cancer, anti-diabetic, and antibacterial properties provide a ray of hope in the fight against

illnesses that kill people all over the world. The presence of a diverse range of bioactive phytochemicals in *R. communis* is responsible for its diverse biological actions. This study shows that the pharmacological and therapeutic potential of plant extracts may be attributed to both the crude form and isolated components. *R. communis* was utilised to make nanoparticles that were used to investigate its efficacy against microbial pathogens and cancer cell lines; these nanoparticles will be useful in target medication delivery.

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